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10/593,098	10/24/2006	Susumu Kitagawa	1034228-000002	7829
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ART UNIT		PAPER NUMBER		
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

### Office Action Summary

**Application No.**

10/593,098

**Applicant(s)**

KITAGAWA ET AL.

**Examiner**

ROBERT C. BOYLE

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 30-34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 35-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-85/86)  
Paper No(s)/Mail Date 8/21/2009
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Inventor's Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action. Any rejections stated in the previous Office Action and not repeated below are withdrawn.
2. In particular, the 112 rejection of claim 6 is withdrawn due to the amendments made. It is noted that in response to the preceding action, Applicants have now submitted an IDS which turns out to contain a document, Uemura et al., "Formation of a One-Dimensional Array of Oxygen in a Nonchannel of a Porous Coordination Polymer", Polymer Preprints, 2003, pp 2837-2838, Vol. 52, No. 11, filed August 21, 2009 that is particularly relevant against the present claims.
3. The new grounds of rejection set forth below are based on the said relevant document cited in paragraph 2 above. Therefore, following action is properly made NON-FINAL.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4-6, 8-11, 18-19, 28-29, 35-36, 41 are rejected under 35 U.S.C. 102(b) as being anticipated by **Thompson** (US 5,906,892),

6. As to claims 1 and 4, Thompson teaches a porous metal complex structure (Figures 2-3; formula V) having metal ions, pillar ligands binding the metal ions, an organic polymer and a compound capable of binding to the metal ion, such as carboxylate (abstract; col. 2, lines 18-35, 50-67; col. 3, line 1-col. 4, line 52; col. 5, lines 5-54; col. 6, lines 56-65).
7. As to claims 5-6, Thompson teaches the pillar ligands are perpendicular to the metal layers (Figures 1-3).
8. As to claims 8-9, Thompson teaches the metal layers form dimers with other layers (Figures 1-3; formula V).
9. As to claim 10, Thompson teaches platinum is incorporated into the complex (col. 7, lines 1-67; col. 8, lines 35-50).
10. As to claim 11, Thompson teaches the metal is divalent (col. 3, lines 52-56).
11. As to claim 18-19, Thompson teaches the pillar ligand has bipyridinium (col. 4, lines 39-52).
12. As to claims 28-29, Thompson teaches the adsorption of metals (col. 10, lines 8-29).
13. As to claim 35, Thompson teaches mixing the components to form the complex structure (col. 23, lines 19-55).
14. As to claim 36, Thompson does not state the temperature. However, one of ordinary skill in the art would recognize that when a temperature is not specified in a synthetic reaction, standard temperature applies. Because Uemura Poly Pre does not state a specified temperature, the synthesis was done at standard temperature, which falls within the claimed range.
15. As to claim 41, Thompson teaches adding the metal ions as a compound (col. 23, lines 19-55).

16. Claims 1, 4, 10-11, 13 are rejected under 35 U.S.C. 102(b) as being anticipated by **Uemura et al.**, J.Am.Chem.Soc. 2003, 125, 7814-7815 ("Uemura JACS").
17. As to claim 1, Uemura JACS teaches an organometallic structure of an iron ion, with an organic polymer, polyvinylpyrrolidone, and CN ligands where the complex has voids formed (pages 7814-7815; Scheme 1). It is noted that the CN ligand is present in the complex function as both pillar ligands and organic compounds capable of binding to the metal ion.
18. As to claim 4, Uemura JACS teaches the pores are arrayed regularly (Scheme 1).
19. As to claims 10-11, Uemura JACS teaches using Fe(II) (Scheme 1).
20. As to claim 13, Uemura JACS teaches using the CN ligand (Scheme 1).
21. Claims 1-29, 35-37 are rejected under 35 U.S.C. 102(a) as being anticipated by **Uemura et al.**, "Formation of a One-Dimensional Array of Oxygen in a Nonchannel of a Porous Coordination Polymer", Polymer Preprints, 2003, pp 2837-2838, Vol. 52, No. 11 ("Uemura Poly Pre") cited in the IDS filed August 21, 2009. The English translation provided by the Applicant is used for citation purposes.
22. As to claims 1-2, Uemura Poly Pre teaches a porous organometallic complex,  $[\text{Cu}_2(\text{pzdc})_2(\text{pyz})]$  where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page).
23. As to claim 3, Uemura Poly Pre teaches water is present in the pores (first page).

24. As to claims 4-6 and 8-9, Uemura Poly Pre teaches a regular pore array with pillar ligands arranged perpendicular to the organometallic layers with ligands forming dimmers with the metal centers (figure 1).
25. As to claim 7, Uemura Poly Pre teaches the size of the pores change on removal of water (second page).
26. As to claims 10-12, Uemura Poly Pre teaches using a copper atom (first page).
27. As to claims 13-15, Uemura Poly Pre teaches the use of the pyrazine dicarboxylate ligand (first page).
28. As to claims 16-17, Uemura Poly Pre teaches ligands that are hydrophobic and hydrophilic (first page).
29. As to claims 18-20, Uemura Poly Pre teaches using pyrazine (first page).
30. As to claims 21-22, Uemura Poly Pre teaches the complex changes size on stimulus removing water (second page), therefore the pillar ligand is capable of being transformed.
31. As to claim 23, Uemura Poly Pre teaches pyz as the pillar ligand (first page) which can interact through  $\pi$ - $\pi$  stacking (figure 1).
32. As to claims 24-26, Uemura Poly Pre teaches PVSA (third page).
33. As to claim 27, Uemura Poly Pre teaches nanowires (third page).
34. As to claims 28-29, Uemura Poly Pre teaches the desorption of water and adsorption of oxygen (first and second pages).
35. As to claim 35, Uemura Poly Pre teaches mixing a copper compound, pyz, pzdc and PVSA (first page, third page).

36. As to claim 36, Uemura Poly Pre does not state the temperature. However, one of ordinary skill in the art would recognize that when a temperature is not specified in a synthetic reaction, standard temperature applies. Because Uemura Poly Pre does not state a specified temperature, the synthesis was done at standard temperature, which falls within the claimed range.

37. As to claim 37, Uemura Poly Pre does not teach the mixing ratio. However, it is the examiner's position that the ratio of ingredients is a result effective variable because changing it will clearly affect the type of product obtained. See MPEP 2144.05(B). Case law holds that "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In view of this, it would have been obvious to one of ordinary skill in the art to utilize the ratio of ingredients within the scope of the present claims so as to produce desired end results.

***Claim Rejections - 35 USC § 103***

38. Claims 38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura Poly Pre**. The discussion with respect to Uemura Poly Pre as set forth in paragraphs 21-37 above is incorporated here by reference.

39. As to claim 38, Uemura Poly Pre teaches a porous organometallic complex,  $[\text{Cu}_2(\text{pzdc})_2(\text{pyz})]$  where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura Poly Pre does not teach stirring. However, it would have been obvious to stir a reaction because without

stirring, the reaction mixture would not be adequately mixed and the reaction would either take longer than necessary or not go to completion.

40. As to claim 41, Uemura PolyPre teaches Cu(II) is used as a starting material (first page). It would have been obvious to one of ordinary skill in the art that copper in the second oxidation state must be part of a compound to stabilize the Cu(II).

41. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura Poly Pre** in view of **Uemura JACS**. The discussion with respect to Uemura Poly Pre and Uemura JACS as set forth in paragraphs 16-40 above is incorporated here by reference.

42. As to claim 37, Uemura Poly Pre teaches a porous organometallic complex,  $[\text{Cu}_2(\text{pzdc})_2(\text{pyz})]$  where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura PolyPre does not teach the ratio of ingredients.

43. Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15). It would have been obvious to one of ordinary skill in the art to use the ratio of Uemura JACS with the compound of Uemura PolyPre because Uemura JACS teaches a more organic molecules result in smaller, more uniform particles (Uemura JACS: figure 1).

44. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura Poly Pre** in view of **Anderson** (US 4,818,898). The discussion with respect to Uemura Poly Pre as set forth in paragraphs 21-43 above is incorporated here by reference.



45. As to claims 39-40, Uemura Poly Pre teaches a porous organometallic complex,  $[\text{Cu}_2(\text{pzdc})_2(\text{pyz})]$  where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura PolyPre does not teach applying pressure to a crystal or powder.

46. Anderson teaches applying pressure or molding crystals (col. 7, lines 30-35). It would have been obvious to one skilled in the art that pressure could be applied via fingers. It would have been obvious to apply pressure because orienting organometallic lattices allows for adjusting properties such as optical scattering (col. 7, lines 26-39).

47. Claims 1-23, 27-29, 35-36, 38, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** et al., *Angew. Chem. Int. Ed.* 1999, 38 in view of **Moulton** et al., *Chem Rev.* 2001, 101, 1629.

48. As to claim 1, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})]_x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). The corresponding structure is porous (figure 2). Kondo does not teach an organic polymer.

49. Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). It would have been obvious to use the coordination polymers of Moulton with the organometallic compound of Kondo because both teach forming lattice compounds with pores and Moulton teaches that the use of coordination polymers allows a diversity of structures and modification of the inherent cavities giving high levels of porosity and thermal stability (pages 1632-33).

50. As to claims 2-3, Kondo teaches a complex structure with the ratio of 2:2:1 that is complexed to water (scheme 1).
51. As to claim 4, Kondo teaches that pores have a specific size and are arrayed regularly (Scheme 1 and Figures 1 and 2).
52. As to claims 5-6, Kondo teaches the spatial relation of the layers to the pillar ligands and the pore (scheme 1 and figure 2).
53. Claim 7 describes a property of the complex structure: the size of the pores is capable of being changed. Kondo teaches the same complex structure as claimed. It is therefore inherent that the complex of Kondo has pore sizes capable of being changed since such a property is evidently dependent on the nature of the composition used. Case law holds that a material and its properties are inseparable. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).
54. As to claim 8, Kondo teaches an organometallic layer structural units bridged by organic compounds and the metal ions forming dimer units (scheme 1 and figure 2).
55. As to claim 9, Kondo teaches the orientation of the pillar ligand and that it is bound to two metal ions (scheme 1 and figure 2).
56. As to claims 10-12, Kondo teaches the use of divalent copper (scheme 1).
57. As to claims 13-15, Kondo teaches using pyrazine-2,3-dicarboxylate (scheme 1 and figure 2).
58. As to claims 16-17, Kondo teaches using pyrazine, which is hydrophobic, and pyrazine-2,3-dicarboxylate, which is hydrophilic (scheme 1 and figure 2).
59. As to claims 18-20, Kondo teaches using pyrazine as the pillar ligand (scheme 1).

60. As to claims 21-22, Kondo teaches using pia (see scheme 1) which can be expanded, contracted, or transformed under stimulus.

61. As to claim 23, Kondo teaches using pyrazine as the pillar ligand (scheme 1). Kondo does not elaborate on the properties of  $\pi$ - $\pi$  stacking. However, since all the components of the organometallic complex structure that is disclosed in claims 1 and 23 and which is taught in Kondo are the same, one of ordinary skill in the art would have recognized that the pillar ligands in the organometallic complex structure taught in Kondo would also have  $\pi$ - $\pi$  stacking.

62. As to claim 27, Kondo does not elaborate on the properties of crystalline structure. However, since all the components of the organometallic complex structure that is disclosed in claims 1 and 23 and which is taught in Kondo are the same, one of ordinary skill in the art would have known that the crystal structure of the organometallic complex structure taught in Kondo would also be either plate-like, granular or wire-like.

63. As to claims 28-29, Kondo teaches using the organometallic structure for adsorption of methane (figure 4).

64. It is noted that claims 28-29 disclose intended uses of the organometallic structure. As to statements of intended use, MPEP 2111.02 states:

During examination, statements in the preamble reciting the purpose or intended use of the claimed invention must be evaluated to determine whether the recited purpose or intended use results in a structural difference (or, in the case of process claims, manipulative difference) between the claimed invention and the prior art. If so, the recitation serves to limit the claim. [MPEP 2111.02 (Citing *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963)]

No structural difference can be discerned between the prior art and the instant invention.

65. As to claim 35, Kondo teaches mixing a copper ion, the pillar ligand and the organic compound (Experimental Section). Kondo does not teach mixing the organic polymer. Moulton teaches the addition of a polymer to engineer frameworks (pages 1632-33).
66. As to claim 36, Kondo teaches making an organometallic complex structure at room temperature (see Experimental Section).
67. As to claim 38, it would have been obvious to stir a reaction because without stirring, the reaction mixture would not be adequately mixed and the reaction would either take longer than necessary or not go to completion.
68. As to claim 41, Kondo teaches mixing  $\text{Cu}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ , a compound containing the metal ion (Experimental Section).
69. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** et al., *Angew. Chem. Int. Ed.* 1999, 38 in view of **Moulton** et al., *Chem Rev.* 2001, 101, 1629 and **Millich** et al., *J. Phys. Chem.* 1962, 66(6), 1070. The discussion with respect to Kondo and Moulton as set forth in paragraphs 47-68 above is incorporated here by reference.
70. As to claims 24-26, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})]_x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach the use of ionic polymers.
71. Millich teaches using polyvinylsulfonic acid (PVSA) in the interaction of metal ions, including Cu (see page 1072, section C). It would have been obvious to use the polymers of Millich with the complex of Kondo and Moulton because Kondo forms a repeating, crystalline

organometallic complex structure and is concerned about controlling the characteristics of the structures of the network (Kondo: figure 2; page 142) and Moulton teaches supramolecular isomerism and polymorphism in complex networks (Moulton: abstract) and using coordination polymers to guide crystal self assembly (Moulton: section II, page 1623) and Millich teaches coacervation polymers to coordinate metal ions (see page 1072, section C) and coacervation polymers are the type of coordination polymers necessary to guide self assembly because they help separate out components into different phases.

72. Claims 1-23, 27-29, 35-38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** in view of **Uemura JACS**. The discussion with respect to Kondo as set forth in paragraphs 9-30 above is incorporated here by reference.

73. As to claim 1, Kondo teaches the synthesis of  $[Cu_2(pzdc)_2(L)]_xH_2O$ , where  $pzdc$  = pyrazine-2,3-dicarboxylate,  $L$  = pyrazine (see scheme 1). The corresponding structure is porous (figure 2). Kondo does not teach an organic polymer.

74. Uemura JACS teaches using an organic polymer to form an organometallic structure (pages 7814-7815). It would have been obvious to one of ordinary skill in the art to use the organic polymer of Uemura JACS with the complex of Kondo because the organic polymer provides steric stabilization during growth processes (page 7814).

75. Claims 2-23 and 27-29 describe elements of the organometallic complex that are satisfied by the complex taught by Kondo (Scheme 1 and Figures 1 and 2). See paragraphs 47-68, incorporated here by reference, above for a detailed treatment of each claim.

76. As to claim 35, Kondo teaches mixing a copper ion, the pillar ligand and the organic compound (Experimental Section). Kondo does not teach mixing the organic polymer. Moulton teaches the addition of a polymer to engineer frameworks (pages 1632-33).

77. As to claim 36, Kondo teaches making an organometallic complex structure at room temperature (see Experimental Section).

78. As to claim 37, Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15).

79. As to claim 38, it would have been obvious to stir a reaction because without stirring, the reaction mixture would not be adequately mixed and the reaction would either take longer than necessary or not go to completion.

80. As to claim 41, Kondo teaches mixing  $\text{Cu}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ , a compound containing the metal ion (Experimental Section).

81. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Moulton** in view of **Uemura JACS**. The discussion with respect to Kondo, Moulton and Uemura JACS as set forth in paragraphs 47-68 and 72-80 above is incorporated here by reference.

82. As to claim 37, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})]\text{xH}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach teach the ratio of ingredients.

83. Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15). It would have been obvious to one of ordinary skill in the art to use the ratio of Uemura JACS with the complex of Kondo and Moulton because Uemura JACS teaches more organic molecules result in smaller, more uniform particles (Uemura JACS: figure 1).

84. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Moulton** in view of **Anderson**. The discussion with respect to Kondo and Moulton as set forth in paragraphs 47-68 above is incorporated here by reference.

85. As to claims 39-40, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})]_x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach applying pressure to a crystal or powder.

86. Anderson teaches applying pressure or molding crystals (col. 7, lines 30-35). It would have been obvious to one skilled in the art that pressure could be applied via fingers. It would have been obvious to apply pressure because orienting organometallic lattices allows for adjusting properties such as optical scattering (col. 7, lines 26-39).

87. Claims 1-29, 35-36, 38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** in view of **Pellet** (US 5,168,084).

88. As to claim 1, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})]_x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). The corresponding structure is porous (figure 2). Kondo does not teach an organic polymer.

89. Pellet teaches adding an organic polymer to molecular sieve agglomerates (abstract; col. 1, lines 7-17, 31-49, 60-68; col. 2, lines 50-68; col. 5, lines 33-37; col. 6, lines 22-63). It would have been obvious to use the polymers of Pellet with the complex of Kondo because Kondo teaches a complex used for adsorption (Kondo: scheme 1, figure 1; page 142) and Pellet teaches polymers reduce pore mouth blockage and improve diffusivity (col. 1, lines 60-64; col. 2, lines 50-54).

90. Claims 2-23 and 27-29 describe elements of the organometallic complex that are satisfied by the complex taught by Kondo (Scheme 1 and Figures 1 and 2). See paragraphs 47-68, incorporated here by reference, above for a detailed treatment of each claim.

91. As to claims 24-26, Pellet teaches using water soluble salts of polyvinylsulfonic acid (col. 6, lines 37-63). It would have been obvious to one of ordinary skill in the art that the water soluble salts taught in Pellet describe a genus that encompasses the claimed sodium salt because the sodium salt of polyvinylsulfonic acid is soluble in water.

92. As to claim 35, Kondo teaches mixing a copper ion, the pillar ligand and the organic compound (Experimental Section). Kondo does not teach mixing the organic polymer. Pellet teaches the addition of a polymer to the molecular sieve (col. 2, lines 20-47).

93. As to claim 36, Kondo teaches making an organometallic complex structure at room temperature (see Experimental Section).

94. As to claim 38, it would have been obvious to stir a reaction because without stirring, the reaction mixture would not be adequately mixed and the reaction would either take longer than necessary or not go to completion.



95. As to claim 41, Kondo teaches mixing  $\text{Cu}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ , a compound containing the metal ion (Experimental Section).

96. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Pellet** in view of **Uemura JACS**. The discussion with respect to Kondo and Pellet as set forth in paragraphs 87-95 above is incorporated here by reference.

97. As to claim 37, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})] \cdot x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Pellet teaches adding an organic polymer to molecular sieve agglomerates (abstract; col. 1, lines 7-17, 31-49, 60-68; col. 2, lines 50-68; col. 5, lines 33-37; col. 6, lines 22-63). Kondo and Pellet do not teach the ratio of ingredients.

98. Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15). It would have been obvious to one of ordinary skill in the art to use the ratio of Uemura JACS with the complex of Kondo and Moulton because Uemura JACS teaches more organic molecules result in smaller, more uniform particles (Uemura JACS: figure 1).

99. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Pellet** in view of **Anderson**. The discussion with respect to Kondo and Pellet as set forth in paragraphs 87-95 above is incorporated here by reference.

100. As to claims 39-40, Kondo teaches the synthesis of  $[\text{Cu}_2(\text{pzdc})_2(\text{L})] \cdot x\text{H}_2\text{O}$ , where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Pellet teaches adding an organic polymer to molecular sieve agglomerates (abstract; col. 1, lines 7-17, 31-49, 60-68; col. 2, lines

50-68; col. 5, lines 33-37; col. 6, lines 22-63). Kondo and Pellet do not teach applying pressure to a crystal or powder.

101. Anderson teaches applying pressure or molding crystals (col. 7, lines 30-35). It would have been obvious to one skilled in the art that pressure could be applied via fingers. It would have been obvious to apply pressure because orienting organometallic lattices allows for adjusting properties such as optical scattering (col. 7, lines 26-39).

#### ***Response to Arguments***

102. Applicant's arguments filed June 18, 2009 have been fully considered but they are not persuasive.

103. In response to applicant's argument that there is no suggestion to combine the references Kondo, Moulton and Millich, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

104. In this case, Applicant argues that no motivation to combine Millich and Kondo exists because Millich relates to coacervation induced by heavy metal ions, Kondo discloses an organometallic complex structure, and Moulton merely discloses general comments on the

selection of materials in the preparation of a node and spacer approach. Applicant's argument is not persuasive.

105. Applicant is directed to the reference Moulton et al., Chem Rev. 2001, 101, 1629. One of ordinary skill in the art would recognize that Kondo forms a repeating, crystalline organometallic complex structure and is concerned about controlling the characteristics of the structures of the network (see figure 2; first paragraph, page 142) and Moulton teaches supramolecular isomerism and polymorphism in complex networks (see abstract) and using coordination polymers to guide crystal self assembly (*see* section II, page 1623). One of ordinary skill in the art would recognize that polymers that interact with heavy metal ions in processes such as coacervation would be coordination polymers that would satisfy the parameters of Moulton. Furthermore, coacervation polymers would be the type of coordination polymers necessary to guide self assembly because they help separate out components into different phases. Millich teaches coacervation polymers to coordinate metal ions (see page 1072, section C). Therefore, Applicant's arguments are not persuasive.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT C. BOYLE whose telephone number is (571)270-7347. The examiner can normally be reached on Monday-Thursday, 9:00AM-5:00PM Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571)272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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